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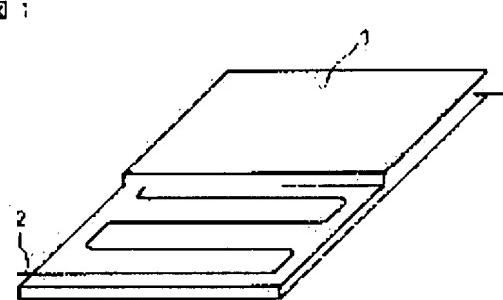
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(54) BIODEGRADABLE RESIN MOLDED PRODUCT

(57)Abstract:

PROBLEM TO BE SOLVED: To improve the decomposition speed of a biodegradable resin molded product.

SOLUTION: A means to accelerate decomposition by exothermic action or a means to accelerate decomposition by catalytic action is incorporated into a biodegradable resin molded product. Further, this molded product is formed of a biodegradable resin composition containing a natural material having a slow decomposition speed.



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CLAIMS

[Claim(s)]

[Claim 1] The biodegradability resin Plastic solid which consists of biodegradability resin and includes a means to carry out decomposition promotion of said biodegradability resin according to an exothermic effect.

[Claim 2] The biodegradability resin Plastic solid according to claim 1 said whose decomposition promotion means is a nichrome wire.

[Claim 3] The biodegradability resin Plastic solid according to claim 1 said whose decomposition promotion means is iron powder.

[Claim 4] The biodegradability resin Plastic solid according to claim 1 said whose decomposition promotion means is hydrophilic biodegradability resin.

[Claim 5] The biodegradability resin Plastic solid according to claim 1 said whose decomposition promotion means are water and a filler with high compatibility.

[Claim 6] The biodegradability resin Plastic solid which consists of biodegradability resin and includes a means to carry out decomposition promotion of said biodegradability resin by the catalysis.

[Claim 7] The biodegradability resin Plastic solid according to claim 6 said whose decomposition promotion means is an ultraviolet-rays activity catalyst.

[Claim 8] The biodegradability resin Plastic solid according to claim 6 said whose decomposition promotion means is an elevated-temperature activity catalyst.

[Claim 9] The biodegradability resin Plastic solid formed from the constituent containing a natural ingredient with catabolic rate slower than biodegradability resin and this biodegradability resin.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the biodegradability resin Plastic solid whose catabolic rate improved.

[0002]

[Description of the Prior Art] Plastics is a chemical very stable compound, its endurance is high, and it is used in many fields. Although this plastics is satisfactory as long as eye stable backlash and original use are performed, many problems follow on abandonment at the time of becoming unnecessary. That is, although abandonment plastics is disposed of by the current general target by reclamation or incineration, since it does not decompose over a long period of time in reclamation disposal, and it will generate an elevated temperature if it destroys by fire, it becomes the cause which damages an incinerator, it also serves as a generation source of harmful matter, such as the so-called dioxin, further, and serves as a big social problem.

[0003] Then, in order to solve these problems, the biodegradability resin disassembled into water and a carbon dioxide by a microorganism etc. in the inside of soil or underwater is proposed. For example, in patent No. 3068174, the biodegradability resin which used polylactic acid as the base is proposed.

[0004] By the way, disassembly of the biodegradability resin by the microorganism is the following, and is considered to make and go on. The dialytic ferment secreted out of the fungus body of a microorganism on the surface of resin adsorbs first, and a hydrolysis reaction cuts chemical bonds, such as an ester bond of the giant-molecule chain which constitutes resin, a glycosidic linkage, and peptide linkage. Consequently, low-molecular quantification is carried out, and resin collapses, and serves as a low-molecular-weight resolvability living thing of the monomer of a monomer, or a dimer which constitutes resin by zymolysis further. Generally the process so far is called being a primary decomposition fault. In this way, after molecular weight is decomposed into the low molecular weight compound of hundreds or less monomer or a dimer, this resolvability living thing is incorporated to the microorganism inside of the body, and is completely decomposed through a metabolic fate with various microorganism inside of the body. It is called that this process is a full decomposition fault.

[0005]

[Problem(s) to be Solved by the Invention] However, in the nature, the advance like the above-mentioned primary decomposition fault was slow, and the biodegradability resin Plastic solid of the biodegradability for a dialytic ferment acting only on the front face, and not acting even on the interior which is the big lump of especially biodegradability resin was inadequate. This invention solves such a problem, collapse of a biodegradability resin Plastic solid is promoted, and it aims at offering the biodegradability resin Plastic solid which raised catabolic rate as a result.

[0006]

[Means for Solving the Problem] In order to solve the above-mentioned trouble, according to the 1st invention, in the biodegradability resin Plastic solid which consists of biodegradability resin, a means to carry out decomposition promotion of said biodegradability resin according to an exothermic effect is

included.

[0007] In order to solve the above-mentioned trouble, according to the 2nd invention, in the 1st invention, the nichrome wire is used as said decomposition promotion means. In order to solve the above-mentioned trouble, according to the 3rd invention, in the 1st invention, iron powder is used as said decomposition promotion means.

[0008] In order to solve the above-mentioned trouble, according to the 4th invention, in the 1st invention, hydrophilic biodegradability resin is used as said decomposition promotion means. In order to solve the above-mentioned trouble, according to the 5th invention, in the 1st invention, water and a filler with high compatibility are used as said decomposition promotion means.

[0009] In order to solve the above-mentioned trouble, according to the 6th invention, in the biodegradability resin Plastic solid which consists of biodegradability resin, a means to carry out decomposition promotion of said biodegradability resin by the catalysis is included. In order to solve the above-mentioned trouble, according to the 7th invention, in the 6th invention, the ultraviolet-rays activity catalyst is used as said decomposition promotion means.

[0010] In order to solve the above-mentioned trouble, according to the 8th invention, in the 6th invention, the elevated-temperature activity catalyst is used as said decomposition promotion means. In order to solve the above-mentioned trouble, according to the 9th invention, the biodegradability resin Plastic solid is formed from the constituent containing a natural ingredient with catabolic rate slower than biodegradability resin and this biodegradability resin.

[0011] In the 1-8th invention, by equipping a biodegradability resin Plastic solid with a decomposition promotion means, the field which it promotes like the primary decomposition fault of biodegradability resin, and a Plastic solid is collapsed, consequently contacts with a microorganism becomes large, it is promoted also like a full decomposition fault, and early decomposition is attained. In the 9th invention, by making the natural ingredient with catabolic rate slower than biodegradability resin mix, biodegradability resin will decompose previously, a Plastic solid will collapse, and early decomposition will be promoted similarly.

[0012]

[Embodiment of the Invention] As mentioned above, biodegradability resin passes like a full decomposition fault like a primary decomposition fault, and is disassembled, and it is thought that it is the depolymerize by hydrolysis of resin like this primary decomposition fault. This hydrolysis is heated or is promoted by the catalysis. So, in this invention, the means which carries out decomposition promotion by the means or catalysis which carries out decomposition promotion according to an exothermic effect is included in the biodegradability resin Plastic solid.

[0013] Reactivity becomes high, so that hydrolysis of resin has low reactivity at the temperature near a room temperature and its temperature is high, and as for the temperature, it is desirable that it is 50 degrees C or more. Then, a means to make the temperature of a biodegradability resin Plastic solid generate heat at about 50-80 degrees C is established.

[0014] As this means, as shown in drawing 1, a nichrome wire 2 is arranged in Plastic solid 1. As biodegradability resin which constitutes a Plastic solid, that what is necessary is just what advances by hydrolysis, most biodegradability resin generally used now can be used like a primary decomposition fault, and it can use aliphatic series polyester system resin, for example, the poly caprolactone, polybutylene succinate, polyethylene succinate, polylactic acid, etc. Although a Plastic solid is formed more in the general fabricating method, for example, press forming, for this biodegradability resin, a nichrome wire 2 is made to mix in the interior of Plastic solid 1 in this case. In this way, after abandonment, by passing the electrical and electric equipment to this nichrome wire, the acquired Plastic solid can generate heat at 50-80 degrees C, and can promote hydrolysis of biodegradability resin. Moreover, at the time of use of a Plastic solid, this nichrome wire functions as reinforcement and the reinforcement effectiveness of a Plastic solid also does it so.

[0015] As other decomposition promotion means, making iron powder mix in a Plastic solid is mentioned. After mixing iron powder to biodegradability resin and distributing it, this biodegradability resin Plastic solid is acquired by fabricating this mixture by the conventional fabricating method. If an

electromagnetic wave is irradiated at the Plastic solid which contains this iron powder after abandonment, iron powder will be heated, a Plastic solid will generate heat, and disassembly of a biodegradability resin Plastic solid will be promoted. Although what is necessary is just enough for making a Plastic solid generate heat at 50-80 degrees C about the particle size and the amount of mixing of iron powder, generally it is desirable that particle size is 10 micrometers - 100 micrometers, and the amount of mixing is 5wt(s)% - 30wt%.

[0016] Making hydrophilic biodegradability resin mix is mentioned as other decomposition promotion means. Polyvinyl alcohol, a polyethylene glycol, etc. can be used as this hydrophilic biodegradability resin. As for the mixed rate of biodegradability resin and hydrophilic biodegradability resin, it is desirable that it is 5wt% - 30wt%. Moreover, as for the particle size of this hydrophilic biodegradability resin, it is desirable that it is 10 micrometers - 30 micrometers. After discarding the biodegradability resin Plastic solid containing this hydrophilic biodegradability resin, if water is made to absorb and microwave is irradiated, a Plastic solid will generate heat and disassembly of a biodegradability resin Plastic solid will be promoted.

[0017] Making water and a filler with high compatibility mix as other decomposition promotion means is mentioned. As this water and a filler with high compatibility, the polymer of an absorptivity polymer, for example, a starch system, a cellulose system, a polyacrylate system, and a polyvinyl alcohol system, silica gel, etc. can be used, and a bridge formation acrylic-acid sodium system polymer is especially desirable. As for the amount of mixing of this filler, it is desirable that it is 5wt(s)% - 30wt%. Moreover, as for the particle size of this filler, it is desirable that it is 1 micrometer - 5 micrometers. After discarding the biodegradability resin Plastic solid containing this water and a filler with high compatibility, if water is made to absorb, a heat of adsorption will occur, a Plastic solid generates heat, and disassembly of a biodegradability resin Plastic solid is promoted.

[0018] It may replace with a means to promote decomposition according to an exothermic effect as mentioned above, and a means to promote decomposition by the catalysis may be included. As this means, making an ultraviolet-rays activity catalyst or an elevated-temperature activity catalyst mix is mentioned. As an ultraviolet-rays activity catalyst, titanium oxide etc. is illustrated and an inorganic oxide, for example, an aluminum oxide, a magnesium silicate, a magnesium oxide, etc. are illustrated as an elevated-temperature activity catalyst. As for the amount of mixing of these catalysts, it is desirable that it is 0.1 to 5 mass [of a Plastic solid] %. By making such a catalyst mix, when irradiating ultraviolet rays in the case of an ultraviolet-rays activity catalyst, by heating, a radical occurs and, in the case of an elevated-temperature activity catalyst, hydrolysis of biodegradability resin is promoted.

[0019] Furthermore, it is also more desirable than the constituent containing a natural ingredient with catabolic rate slower than biodegradability resin and this biodegradability resin to form a Plastic solid. As this natural ingredient, it is desirable to use a kenaf, hemp, cotton, etc., and, as for the compounding ratio of a natural ingredient, it is desirable that it is 10wt(s)% - 50wt%. The Plastic solid formed from such a constituent is discarded, it is not rich, and biodegradability resin with quick catabolic rate begins decomposition previously. Then, since a Plastic solid collapses and it becomes a small lump, it will understand by early rather than the Plastic solid formed only from the same biodegradability resin. In order to promote disassembly of this Plastic solid, it is desirable to make the Plastic solid after abandonment into the supercritical condition of 374 degrees C or more, for example, temperature, and 2 or more MPas of pressures.

[0020]

[Effect of the Invention] According to this invention, by [which are caused especially or uses a natural ingredient with slow catabolic rate] including the means which carries out decomposition promotion by the means or catalysis which carries out decomposition promotion according to an exothermic effect, the collapse after abandonment of the biodegradability resin Plastic solid acquired can be promoted, and catabolic rate can be raised as a result.

[Translation done.]